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way responsible for the alleged one-sided state of biological education.

While Mr. MacMillan's enthusiasm is in a good cause, he has allowed it to run away with his discretion. Without sufficient reflection or inquiry, he has, unintentionally, I am sure, given an entirely wrong impression of the character of work done in several institutions; this is done under a very sensational title and in a style of questionable taste. As it is desirable that this impression should not spread, and as the arrangement of courses in Columbia is cited by Mr. MacMillan as a leading example of the manner in which botany is subordinated to zoölogy, let us see what the Columbia courses are, as announced in the circular of the faculty of pure science:—

- | | |
|---------------------------|--|
| 17 Courses in Botany, | 1. Elementary Botany. |
| in | 2. Elementary Botany. |
| | 3. General Botany. |
| | 4. Vegetable Anatomy. Cells and Tissues. |
| | 5. Morphology and Determination of Flowering Plants. |
| | 6. Economic Botany. |
| | 7. Cryptogamic Botany. |
| A. Department of Botany. | 8. Advanced Vegetable Anatomy. |
| | 9. Natural Orders of Flowering Plants. |
| | 10. Advanced Cryptogamic Botany. |
| | 11. Comparative Study of Tissue of Twelve Species. |
| | 12. Comparative Study of Plants from a Certain Area. |
| | 13. Critical Study of a Genus. |
| in | |
| B. Department of Geology. | 1. Palæobotany. |
| | 2. Study of Flora of Certain Geological Horizons. |
| 3 Courses in Physiology, | 1. General Physiology. Lower Animal Types. |
| in | 2. Human Physiology. Man and Lower Animals |
| Department of Physiology. | 3. Laboratory Physiology. |

There are altogether eleven courses in zoölogy under the Department of Biology, two of which, namely, "Elementary Biology" and "Cellular Biology" are taught in part from plants.

It does not appear that botany is ignored in this programme of biological courses of study in this institution. The fact that the botanical courses are not arranged under the Biological Department is a mere technicality of administration, which raises no confusion in the minds of students, any more than does the separation of the Department of Physiology, which is equally cognate to biology. The separation of these three departments is simply owing to the fact that botany and physiology were already well established when the trustees decided to found a distinct department in which biology would be taught especially as illustrated in animal types.

HENRY F. OSBORN.

Columbia College, New York, April 13.

Cedar Waxwings,

Mr. Edwin M. Hasbrouck's "Presumably new fact relative to the Cedar Waxwings (Amp. Ced.)" in the issue of the 17th ult., is a very interesting discovery. The observations from which his conclusions were obtained, are familiar to modern ornithology, while his inductions are assuredly new to me. Whether they are accepted or not, his views of the importance of carefully studying the *first* plumages of birds will scarcely fail of universal acceptance. I have no criticisms, but wish to add an observation concerning the wax tips of the secondaries and retrices of the species which I am inclined to think will favor his conclusions.

I have made the ultimate anatomical structure of feathers a special study for many years, during which I have given those of the period before the first moulting special consideration, and have met with some extremely interesting things.

I have never been so fortunate as to meet with a wax tip while the young bird was still in the nest, but have occasionally seen them in very fresh subjects, or as early as the 25th of July. The development of the appendage, after it has commenced to ap-

pear, is very rapid indeed, resembling the process of the growth of the new antlers of a buck. I cannot yet state definitely the length of time, but from three to five days ordinarily, and doubtless sometimes a little more. In a work devoted to the Birds of Minnesota, I have made some references to my familiarity with the species, to which I might add many more notes, since that went out of my hands, that are even more in point, but suffice to say, the red wax is secreted in the ciliohamular portion of the barbules of the terminal barbs of the feather.

The rapidity of the development of the appendage is such that occasionally it results in doubling the whole series of barbs with their barbules, back upon the rachis of the feather, and reveals the fact that the horny material constituting the wax-like mass is filled from the tip, shaftward, as if in fact, as in appearance, it consists of genuine red sealing-wax, which has become so thickened or condensed as to cease flowing before quite reaching the point of union of the barb with the delicate, overlaid rachis. The naked portion of those barbs becomes an easy object of observation under low powers of the microscope, and under supremely good light and a higher magnification, the reflected portions of the barb with its barbules, and even the barbicels, may be seen resting upon the unreflected portion of the barbs and rachis. That there is some special condition very temporarily involved, that produces these decorations, there can be no doubt. I have never yet succeeded in seeing a wax-tip on a waxwing reared in captivity, excellent as has been my opportunity. Who next has something new about the Cedar Waxwing?

P. L. HATCH.

An Appeal to Naturalists.

MAY I appeal through your valued columns for the coöperation of the naturalists of the country? The following letter from Professor Kölliker of Würzburg is the occasion of my appeal:—

WÜRZBURG, April 4, 1893.

MY DEAR PROFESSOR MINOT:

May I ask you if you could procure for me some rare American forms of fishes and amphibians, preserved in Müller's fluid, so as to be investigated microscopically after Golgi's and Weigert's method? Larger animals should be cut transversely, so that the fluid can enter the spinal canal and act upon the spinal marrow. At the same time the head or body should be opened and the brain acted upon.

The list of my wishes is very large, but I shall be very glad, if I get only some of the animals mentioned. It includes, among the amphibia and reptiles, *Amphiuma*, *Siren*, *Menobranchus*, *Menopoma*, full-grown and larval, young alligators and tortoises; among the fishes, *Lepidostens*, *Amia*, *Spatularia*, *Scaphyrhynchus*, full-grown and also very young. . . . I am working just now at the microscopic anatomy of the nervous system, and have begun to extend my investigations to the comparative part also. Unfortunately, specimens in spirit only are worth very little, and the only good methods are those of Golgi and Weigert. But even Golgi's is only useful on embryos and young animals, and you know that both these methods demand a previous preservation in Müller's fluid.

Believe me, etc.,

A. KÖLLIKER.

In view of Professor Kölliker's distinguished services to science, covering a period of over fifty years, and of his undiminished activity in research, every one must feel a wish to promote any investigation Professor Kölliker undertakes. In order to secure the material for which Professor Kölliker asks, I seek for contributions from my American colleagues. I request that all specimens may be sent to me at the Harvard Medical School, so as to be in my hands by May 30. All material thus obtained can be packed and forwarded to Professor Kölliker, together with the list of contributors.

The specimens should be kept in the Müller's fluid until they reach Würzburg. In order to secure a good result with the fluid, it must be used in large quantities, and should be changed every day for the first week, and twice during the second week. Müller's fluid will not penetrate hard tissues, such as bone, for more than a quarter of an inch, and soft tissues for more than three-

fourths of an inch. On this account the pieces to be preserved must not be too large.

The best formula for Müller's fluid known to me is:—

Bichromate of potassium	2 per cent
Sulphate of sodium	2 " "
Water	96 " "

In practice it is convenient and sufficiently exact to dissolve two grammes of each salt in 1,000 cubic centimetres of water.

It will be, I am sure, a pleasure to many naturalists in America to learn of an opportunity of rendering a service to Professor Kölliker, to whom we all owe so much, and whose continued activity is perhaps the most remarkable instance of prolonged and fully sustained mental power in the whole history of biological science. We must all feel confident that any material placed at his disposal will be the means of securing important additions to knowledge.

CHARLES SEDGWICK MINOT.

Harvard Medical School, Boston, Mass.

BOOK-REVIEWS.

The Meaning and the Method of Life: A Search for Religion in Biology. By GEORGE M. GOULD. New York, G. P. Putnam's Sons. \$1.75.

THIS book is a result of the unsettled and transitional state of religious opinion. Feeling deeply the want of some religion, but dissatisfied with the religions of the past, Dr. Gould has sought in the phenomena revealed by his favorite science of biology the basis of a new theology and a new religion. His views are somewhat singular. He holds that matter is eternal and independent of God, who is the author of life and mind only, using matter as the material of the living bodies that he forms, but having otherwise no control over it. Hence God is a limited and conditioned being, and, though very wise and perfectly good, is very far from omnipotent. This theory is somewhat like one that had some prevalence in ancient times, which also regarded matter as eternal and the Creator as merely the workman who fashioned it; yet the doctrine of this book limits Him still more, since it confines

Him strictly to the world of life, excluding Him entirely from the vastly larger field of inorganic matter. In this way Dr. Gould thinks that he accounts for the existence of evil, which is due to the limited power of the Creator, whose goodness is thus saved at the expense of his omnipotence. Every living thing is an incarnation of Divinity, and man especially so. Man's duty consists in promoting the growth and fulness of life everywhere, and especially the spiritualization of human life. On the question of immortality, Dr. Gould expresses no decided opinion, holding that God has not seen fit to reveal his design with regard to man's future, and believing that information concerning it would be of no use to us here if we had it.

Such is Dr. Gould's religion; but, though it may find some favor among other biologists, we doubt if it wins acceptance anywhere, for religions and philosophies that deny the Divine omnipotence have never proved congenial to the human mind, and never will. His theory of the universe and its Author is evidently due to a too exclusive study of one science to the neglect of other and wider views, a mode of investigation peculiarly dangerous in theology. But whatever may be thought of his positive doctrines, all true souls will sympathize with the sentiment expressed in his introductory chapter, that "the bravest, noblest attitude is that of unsatisfied longing, and the never stilled faith that light will come into all of our darkness, and that the riddle of our lives will be solved."

Beiträge zur Kenntniss der Baues und Lebens der Flechten. II. Die Syntrophie. VON DR. ARTHES MINKS. WIEN, 1893.

DR. MINKS of Stettin, Prussia, is, or should be, known to all who are interested in the Lichens, and the controversy with regard to them, as one of the strongest advocates of their autonomy, on grounds peculiarly his own. In various publications he has announced the result of arduous and long-continued investigations, which are at least worthy of serious consideration. They cannot be ignored, as is the fashion among those who adopt the ideas of the new school.

CALENDAR OF SOCIETIES.

Biological Society, Washington.

Apr. 22.—O. F. Cook, Notes on the Natural History of Liberia; J. N. Rose, Two New Trees of Economic Importance from Mexico; V. A. Moore, Observations on the Distribution and Specific Characters of the Streptococci Group of Bacteria; Erwin F. Smith, Peach Yellows and Plant Nutrition.

Geological Society, Washington.

Apr. 26.—The first half hour will be devoted to continuing the discussion concerning the Age of the Earth. Bailey Willis, Interpretation of Sedimentary Rocks; M. R. Campbell, The Influence of Post-Paleozoic Deformation on the Drainage of the Central Appalachians.

Academy of Sciences, Biological Section, New York.

Apr. 10.—H. F. Osborn, on "The Evolution of Teeth in Mammalia in Its Bearing upon the Problem of Phylogeny," reviewed the recent researches and theories of Küken-thal, Röse, and Tacker upon the formation and succession of the dental series in mammalia, and pointed out that, especially in marsupials, cetaceans, and edentates (with other placentates), the existence of two series of teeth was now abundantly proven, as well as the fact that Homodynamous forms were derived from early Heterodont. He then showed that recent discoveries demonstrated that in marsupials

teeth of the second series might be interposed in the first series—to explain the typical dentition of such forms of Didelphys. This transposition enables a comparison of dentition of marsupial with that of turassic mammalia $\left(= i, \frac{4}{4}, c, \frac{1}{1}, p, \frac{4}{4}, m, \frac{8}{8} \right)$. It

was further noted that the triconodont type (as Amphilestes) was probably the hypothetical point of divergence of placental mammalia. As to the form of crowns, the theory (Kükenthal-Röse) that complex mammalian types were made by concrescence of simple reptilian cusps was upon the evidence of the turassic mammalia shown untenable, as well as the converse theory that cetaceans have derived homodynamous form by the splitting of the cusps of triconodont. Bashford Dean, in "Contributions to the Anatomy of Dinichthys," correlated the parts of this Devon-Lower Carboniferous Arthrodiran to those of Coccosteus. Notes were made upon the (1) disposition and character of the lateral line organs, (2) pineal foramen, (3) nasal capsules, (4) dentary plates (homologies), (5) ginglymoid articulation of lateral shoulder plates, (6) character of shagreen, (7) probable disposition of paired and unpaired fins. N. L. Britton presented a "Note on the Genus Lechea." This genus of Cistineæ is entirely American, and, from the investigations of Mr. Wm. H. Leggett and Dr. Britton, appears to consist of about fourteen species.

Agassiz Scientific Society, Corvallis, Ore.

Apr. 13.—C. D. Thompson, Relation of Soils to Plant Growth.

Mar. 8.—Professor John M. Bloss, The Early Lives of Some of Our Scientists.

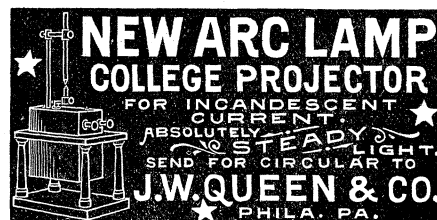
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